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Research papers

Triassic *Kykloxylon* wood (Umkomasiaceae, Gymnospermopsida) from Skinner Ridge, northern Victoria Land, East Antarctica

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ABSTRACT

During the first Korea Antarctic Geological Expedition (KAGEX I, 2013/2014), fossil wood was collected from the Triassic fluvial deposits of the Beacon Supergroup at Skinner Ridge in northern Victoria Land, Antarctica. The material is coalified and partially silicified; most specimens are slightly compressed due to burial compaction. In spite of this imperfect preservation, anatomical features of both the xylem and the pith could be observed in some specimens. The xylem displays prominent growth rings and usually araucarioid or somewhat mixed-type radial pitting with some abnormal rings partly composed of parenchymatous tissues. Some specimens also have a wood cylinder that is divided radially by parenchymatous zones. These anatomical features indicate a systematic affinity with *Kykloxylon* Mey.-Berth., T.N.Taylor et Ed.L.Taylor, a characteristic wood type of the Umkomaciaceae, which flourished throughout Gondwana during the Triassic. The *Kykloxylon* specimens in this study represent the only wood fossil taxon in the Triassic of Victoria Land, except for a dubious report of *Antarcticoxylon* Seward in 1914. This may indicate a low diversity of Triassic wood fossils in this area, as in other parts of Antarctica. On the contrary, diverse other gymnosperm organs are known to occur in the Triassic of Antarctica. This low diversity of wood taxa compared to the various plant organs in the Triassic of Antarctica is remarkable. We hypothesize three major reasons for this: 1) the overall structural uniformity of gymnosperm wood compared to other vegetative and especially reproductive organ diversity; 2) the overwhelming dominance of corystosperm plants, with a minor component of voltzialean conifers in the canopy-forming forest vegetation during the Triassic in Antarctica; and 3) the very few systematic studies of fossil wood compared to other plant macrofossils.

1. Introduction

Numerous plant-fossil assemblages in the extensively exposed Triassic deposits of Antarctica have provided a wealth of information on the early Mesozoic vegetation of southern Gondwana (e.g., Barrett et al., 1986; Collinson et al., 1986, 1994; Escapa et al., 2011; Cantrill and Poole, 2012 and references therein). Although some possible occurrences of Triassic plant fossils have been reported from the Antarctic Peninsula (e.g., Lacey and Lucas, 1981; Barale et al., 1994), most Triassic plant fossils are known from the Central Transantarctic Mountains, southern Victoria Land, northern Victoria Land, and—to a lesser extent—the Prince Charles Mountains. Of particular importance are the permineralized peat deposits of the Fremouw Formation in the Central Transantarctic Mountains, which contain a rich and diverse assemblage of structurally preserved plant remains, including sphenophytes (Osborn and Taylor, 1989; Osborn et al., 2000; Ryberg et al., 2008), ferns (e.g., Schopf, 1978; Millay and Taylor, 1990; Phipps et al., 2000; Rothwell et al., 2002; Klavins et al., 2004), seed ferns (Pigg, 1990; Meyer-Berthaud et al., 1992, 1993; Osborn and Taylor, 1993; Taylor et al., 1994; Yao et al., 1995; Klavins et al., 2002; Bomfleur et al., 2014c), cycads (e.g., Smoot et al., 1985; Klavins et al., 2003; Hermsen et al., 2007a), and conifers (e.g., Mey.-Berth. et T.N.Taylor, 1991; Yao et al., 1997; Axsmith et al., 1998; Hermsen et al., 2007b). The systematic affinities and palaeoenvironmental significance of fossil wood associated with these peat deposits in the Central Transantarctic have received considerable attention (Mey.-Berth. et T.N.Taylor,

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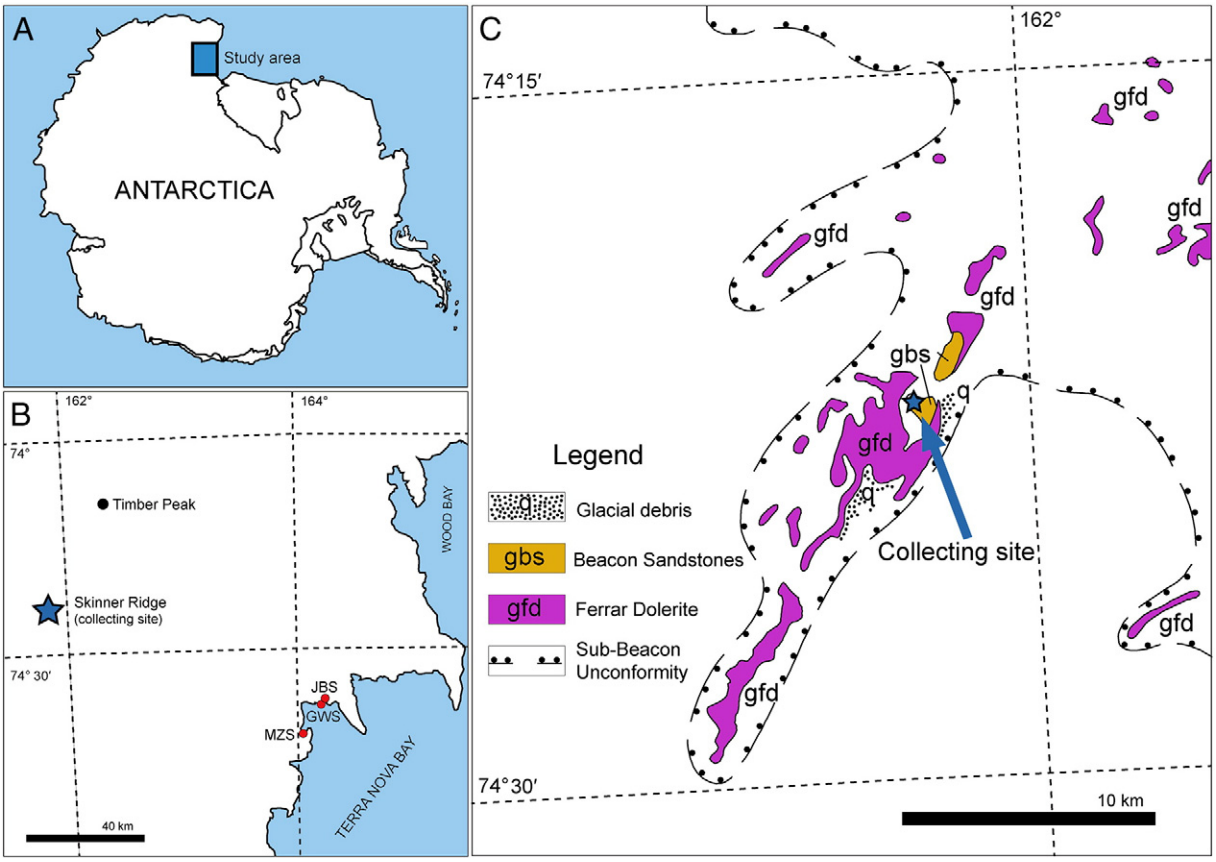

Fig. 1. Geographic and geological map showing the study area and collecting site. (A) Geographic map of Antarctica with study area indicated by blue rectangle. (B) Geographic map of the Eisenhower Range area in northern Victoria Land in Antarctica with collecting site indicated by blue star (JBS=Jang Bogo Station, Korea; GWS=Gondwana Station, Germany; MZS=Mario Zucchelli Station, Italy). (C) Geological map of the Skinner Ridge area with collecting site indicated by blue arrow (from GANOVEX Team, 1987).

1991; Taylor, 1992; Meyer-Berthaud et al., 1992, 1993; Del Fueyo et al., 1995; Cúneo et al., 2003; Ryberg and Taylor, 2007; Decombeix et al., 2010a, 2014). However, it is noticeable that the diversity of gymnosperm wood taxa is significantly lower than that of other gymnosperm plant organs in the associated peat deposits and compression floras.

In the course of the 9th German Antarctic North Victoria Land Expedition (GANOVEX IX; 2005/2006), new and well-preserved Triassic plant-fossil assemblages were found also in northern Victoria Land (Bomfleur et al., 2007, 2011a). However, the study of these new Triassic fossil deposits has focused almost exclusively on compression remains (Bomfleur et al., 2007, 2011a; Bomfleur and Kerp, 2010), and the wood fossils, which may provide information on the Triassic wood diversity in northern Victoria Land, have remained unstudied. Here, we present a systematic description of fossil wood from northern Victoria Land that was collected during the first Korea Antarctic Geological Expedition (KAGEX I; 2013/2014) and provide possible explanations for the low diversity of gymnosperm wood in the Antarctic Triassic flora.

2. Geological setting, materials and methods

The material was collected from an isolated exposure of the Beacon Supergroup at Skinner Ridge in the western Eisenhower Range, northern Victoria Land, Antarctica (S74°21′45.53″, E161°51′15.99″) (Fig. 1). The stratigraphy of Beacon Supergroup deposits in this region is poorly resolved due to the poor accessibility and the lack of continuous exposures. The precise stratigraphic relationships between the Palaeozoic deposits in the south and east of the Eisenhower Range and the occurrences of Triassic deposits at Timber Peak and Skinner Ridge remain uncertain. Nevertheless, it has traditionally been assumed that all sedimentary deposits intercalate between the crystalline basement

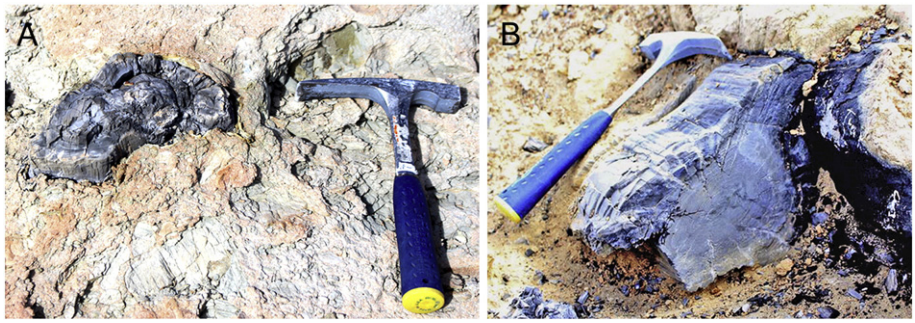

Fig. 2. Field images showing pieces of fossil wood embedded in the sandstone. (A) Upright-buried stem (KOPRIF 20001). (B) Horizontally embedded fossil wood (KOPRIF 20008).